AGRICULTURAL RESEARCH
AT THE
FAIRBANKS RESEARCH CENTER

Agricultural Research
at the
Fairbanks Research Center
Agricultural Experiment Station

School of Agriculture and Land Resources Management
University of Alaska-Fairbanks
Agricultural Research Service, USDA, cooperating

Welcome to the Fairbanks Research Center of the Agricultural Experiment Station, University of Alaska-Fairbanks.

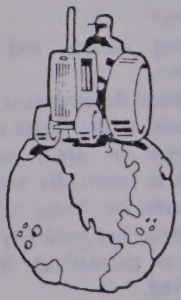
Agricultural Research at Fairbanks

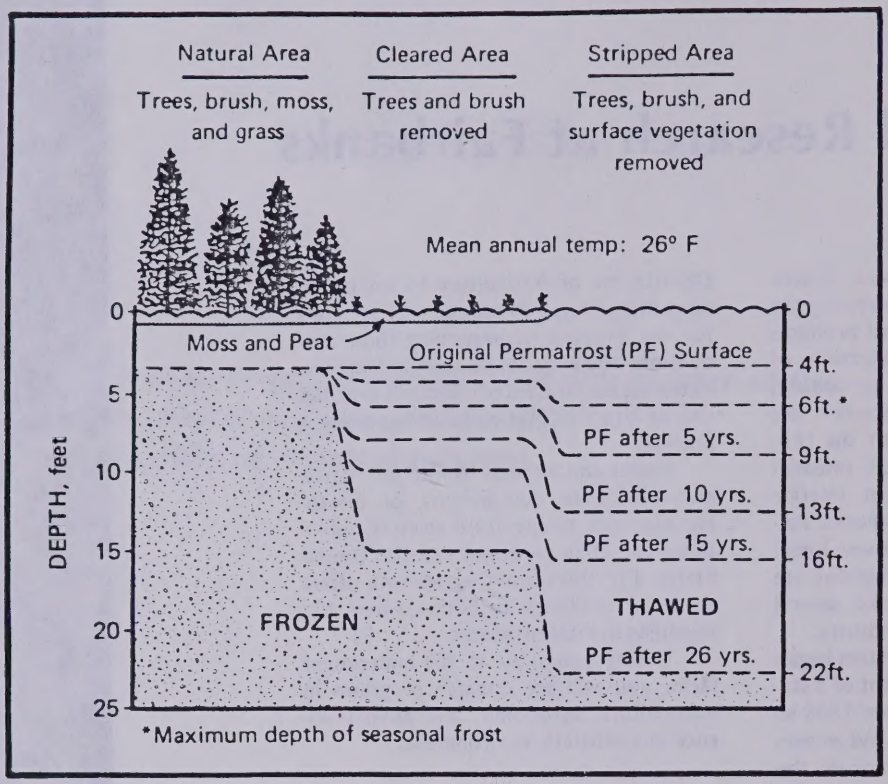
Research at the Agricultural Experiment Station is directed at increasing the production of food and wood products together with the wise utilization of Alaska's land resources for agriculture, forestry, and recreation. Studies are underway in cooperation with the U.S. Department of Agriculture at research centers here at Fairbanks in interior Alaska, at Palmer in the Matanuska Valley, and near Homer on the lower Kenai Peninsula. These research programs are supported by the state of Alaska, several Federal agencies, and private industry.

The experiment station system began in Alaska with the establishment of a station in Sitka that operated from 1898 to 1932. In 1906, homesteaders and miners in the Fairbanks area petitioned the Department of Agriculture to set up an agricultural research station at Fairbanks for the purpose of improving food production. The experiment farm at the Fairbanks Research Center is located near the site of this first Agricultural Experiment Station.

Plants and animals in interior Alaska are subject to day lengths, or photoperiods, and temperature stresses unlike those found anywhere else in the United States. For this reason, agriculture offers a special challenge to both farmers and scientists in interior Alaska.

During your visit to the experiment farm, you will see research programs in horticulture, agronomy, and animal science in a subarctic environment.



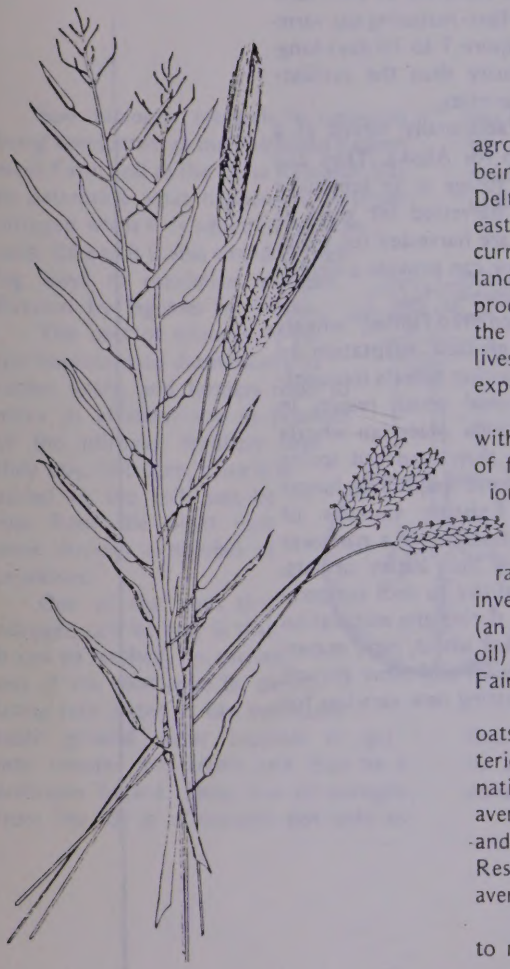


Effect of Permafrost on Agricultural Soils

Although permafrost occurs in much of Alaska's interior, clearing the native vegetation, including the insulating layer of moss and peat, causes the permafrost to thaw as indicated in the illustration above. When agricultural land is cleared for cultivation, thawing of the permafrost continues over time despite recurring seasonal frost. Thus, soil temperatures become warmer in the root zone during the growing season, and soil drainage improves.

Recent agricultural development projects in Alaska, such as the Delta Agricultural Project, are in areas where existing permafrost is essentially free of large masses of ground ice. Thus, subsidence of the soil surface has generally not been a problem as permafrost thaws following land clearing.

Agronomy



Approximately 60 per cent of the agronomy research in interior Alaska is being conducted on research fields near Delta Junction, about 100 miles southeast of Fairbanks. The state of Alaska is currently developing 85,000 acres of new land near Delta Junction for agricultural production. Barley will be produced on the new land to provide a feed base for livestock production in Alaska and for export.

Agronomists in Alaska are concerned with testing and evaluating new varieties of field crops commonly grown in interior Alaska such as barley, oats, and wheat. In addition, crops that are relatively new to Alaska such as rapeseed and buckwheat are also under investigation. Variety trials with rapeseed (an oilseed crop used to produce cooking oil) in 1977-1982 gave excellent yields at Fairbanks.

Many small grains—especially barley, oats, and spring wheat—grow well in interior Alaska, and yields tend to be above national U.S. average yields. Long-term average yields of selected wheat, barley, and oat varieties grown at the Fairbanks Research Center are compared with U.S. average yields in Table 2.

Barley, because of its ability to grow to maturity at cool temperatures and its

Table 2: Yields of Selected Grain Varieties Grown at Fairbanks, Alaska, in Comparison with U.S. Average Yields (bu. per acre).

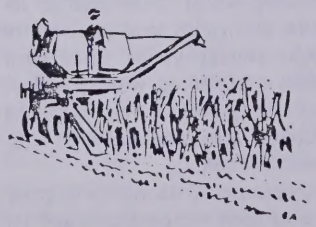
Crop and Variety	Fairbanks Yields		U.S. Avg. Yield
	Average	Range	
Wheat			31
Chena	72	46-87	
Park	59	25-76	
Gasser	54	33-75	
Ingal	54	18-74	
Nogal	60	59-61	
Barley			42
Galt	92	59-127	
Otra	81	50-100	
Weal	78	43-125	
Otal	69	49-95	
Datal	78	56-97	
Oats			48
Toral	140	67-204	
Pendek	120	50-167	
Nip	126	52-159	
Rodney	142	63-178	

short growing-season requirement, must be considered the grain most adapted to far-north environments. Barley may have a winter or spring growth habit. Only those varieties having a spring growth habit are important to Alaska. Barley varieties having a winter growth habit lack hardiness, and therefore have a very low rate of winter survival.

Common oats (*Avena sativa*) must be ranked as the second most adapted grain crop for the Tanana Valley. Although most oat varieties generally require a longer growing season than barley, they will grow to maturity at cool temperatures. The earliest-maturing oat varieties frequently require 7 to 10 days longer to reach maturity than the earliest-maturing barley varieties.

Oats have traditionally served as a dual-purpose crop for Alaska. They can be harvested for forage at an immature growth stage, or harvested for grain at maturity. If oats are harvested for grain, the remaining straw can provide a significant secondary crop.

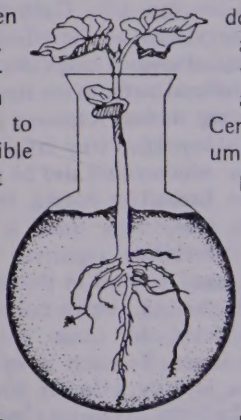
To date, hard red spring wheats have shown the greatest adaptation to Alaska. Hard red winter wheats frequently have poor survival which results in greatly reduced yields. Macaroni wheats usually yield less than hard red spring wheat in Alaska and require a longer growing season. Existing varieties of hard red spring wheats have a narrower range of adaptation than barley or oats. Wheat is more sensitive to cool temperatures, particularly during the maturation stages of growth. For wheat, early maturity far outweighs yield and other growth factors when evaluating new varieties for Alaska.



Soil Nitrogen Research

Soil nitrogen research is currently being conducted at the Fairbanks Experiment Farm and at the Delta Research Site to determine what happens to fertilizer nitrogen when it is added to Alaskan soils. Research is also aimed at finding ways to maximize nitrogen fixation by legumes in Alaska.

The cost of nitrogen fertilizer has increased dramatically in recent years, and farmers need to make as efficient use as possible of the nitrogen fertilizer that they buy. Nitrogen, once it is added to the soil, can be lost from the plant root zone through a number of processes.

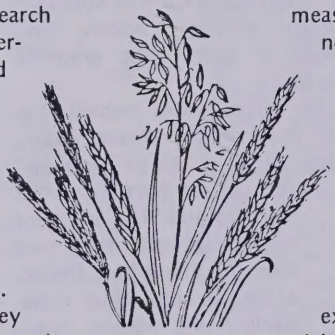


One of the ways that nitrogen can be lost is that it can be leached, i.e. carried, out of the root zone by percolating rain water. It can eventually reach ground water supplies or get into streams and rivers and thus be a pollution hazard. Thus, loss of nitrogen from the soil is of concern not only to the farmer but also to the general public. We are attempting to determine how much of the applied nitrogen fertilizer is utilized by a barley crop and how much and by what means nitrogen is lost from Alaskan soils. This is being done through the use of nonradioactive nitrogen tracers. This work is being done primarily at Delta.

Certain plants, most notably legumes (e.g. alfalfa, clover, beans, peas, etc.), are able to "team up" with certain bacteria, called rhizobia, and "fix" much of the nitrogen that they need from the atmosphere. Hence, a legume crop which is actively fixing nitrogen needs little or no nitrogen fertilizer. Research is currently underway to determine the potential for nitrogen fixation and find ways to maximize nitrogen fixation by alfalfa in Alaska. This work is being done at both Fairbanks and Delta.

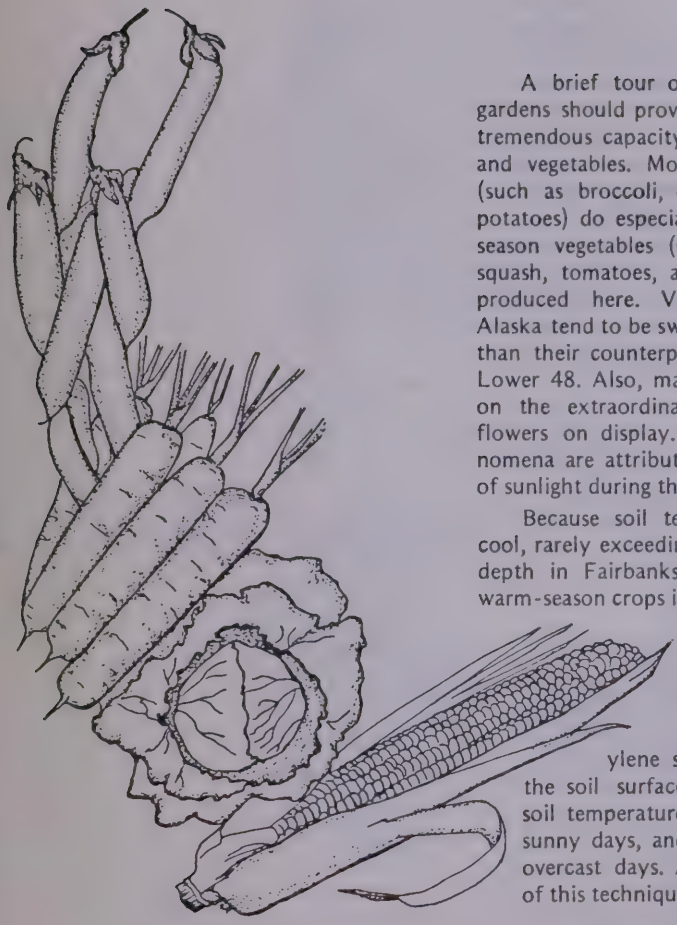
Plant-Protection Research

Plant-protection research includes plant-disease control and weed control. This work is being directed toward agronomic crops such as barley, rapeseed, winter wheat, and spring wheat. The important diseases found on barley are barley scald, stripe, net blotch, and loose smut. Currently, research is being undertaken to determine the yield loss caused by these diseases. Resistance of barley varieties to these diseases is evaluated. The effectiveness of fungicides as seed treatment or foliar application in controlling barley diseases is also evaluated. The weed problems in barley include wild oat and several broadleaf weeds such as lambsquarter, chickweed, and wild buckwheat. Studies are being undertaken to determine yield losses caused by these weeds, their life histories, and cultural and chemical means of control.



Snow mold is the most serious disease problem on winter wheat, winter rye, and several grasses in Alaska. To date, none of the early-maturing, hard red winter wheats tested that are suitable for cultivation in Alaska possess any resistance to this disease. Current research centers on the studies of the life cycle, distribution, and population dynamics of these diseases in the soil. Controlling measures such as the effectiveness of various fungicides and cultural methods are also being studied. Rapeseed is an important crop in Canada which could also be profitable for Alaska. However, since there is no herbicide registered for weed control in this crop in the U.S., weeds could be expected to cause serious yield losses. Research is undertaken to identify effective herbicides for weed control in rapeseed and to evaluate the persistence of herbicides in soil. A new disease, called bacterial mosaic, was found in Alaska on spring wheat recently. Current research on this disease is centered on its life cycle, its mean of transmission, and spread.

Horticulture



A brief tour of the demonstration gardens should provide proof of Alaska's tremendous capacity for growing flowers and vegetables. Most cool-season crops (such as broccoli, cabbage, carrots, and potatoes) do especially well, and warm-season vegetables (such as sweet corn, squash, tomatoes, and peppers) are also produced here. Vegetables grown in Alaska tend to be sweeter and less fibrous than their counterparts produced in the Lower 48. Also, many visitors comment on the extraordinary brilliance of the flowers on display. Both of these phenomena are attributed to the long hours of sunlight during the subarctic summer.

Because soil temperatures here are cool, rarely exceeding 55°F at the 2-inch depth in Fairbanks, the production of warm-season crops is greatly enhanced by raising the soil temperature. One of the best techniques for doing this is to use clear polyethylene sheets as a mulch on the soil surface. This can increase soil temperatures as much as 40° on sunny days, and 5° to 10° even on overcast days. A further refinement of this technique is to add a "tunnel"

made of clear polyethylene over the mulch sheet, creating a small greenhouse. In this way, plants set out early in the season can be protected from frosts, in effect increasing the 90-day growing season. Everbearing strawberries are grown here as annuals using this technique, with yields of 1 pound per square foot of garden space.

Due to our long hours of daylight, cool temperatures, and relatively short growing season, some varieties of vegetables and flowers perform much better here than others. We conduct extensive vegetable variety trials in our experimental plots to determine the commercial and home garden potential of new varieties. Recommended vegetable and flower varieties are shown in our demonstration gardens as well as some new varieties that are being tested. In addition, the Alaska Agricultural Experiment Station is an official display garden for the All-America Selections of vegetables and flowers. These selections are identifed with red, white, and blue stakes.

Although there is presently no plant-breeding program at the Alaska Agricultural Experiment Station, two hardy strawberry varieties — Alaskan Pioneer and Toklat — were developed here in earlier breeding programs and are grown in many local gardens. In addition, Early Tanana tomato and Yukon Chief sweet corn were developed here and can be seen in the demonstration garden.

Yields of selected vegetables varieties obtained at the Fairbanks Research Station are compared with national average yields in Table 1.

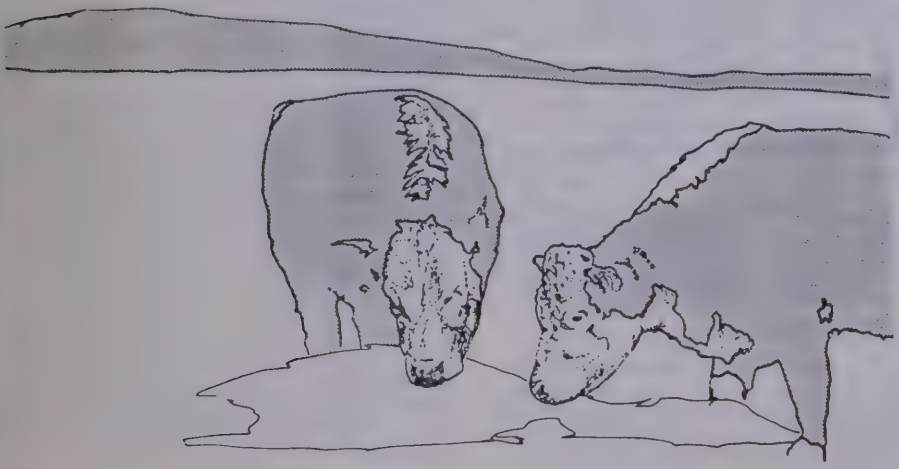
Table 1: Average Yields of Selected Varieties of Vegetable Crops Grown in Fairbanks, Alaska, in Comparison with U.S. Average Yields (lb. per acre).

Crop and Variety	Fairbanks Yield	U.S. Yield
Cabbage		21,800
Hinova (late)	75,296	
Tastie (early)	33,023	
Broccoli		7,700
Emperor	9,840	
Green Duke	8,688	
Cauliflower		8,700
Dominant	20,115	
Delira	17,303	
Lettuce		22,700
Minilake	26,016	
Carrots		26,000
Early Cross	47,045	
Kuroda Chantenay	55,267	
Scarlet Nantes	36,692	

Animal Science

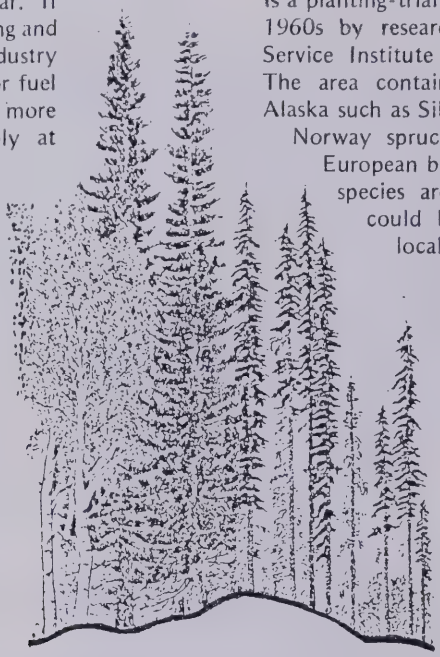
Although Alaska's livestock production provides less than 1 per cent of the red meat consumed in the state, the state has the potential to produce enough red meat to exceed state requirements and possibly become an export product. The development of grain and forage production and an increased availability of rangeland could provide an incentive for red-meat production to meet this potential.

Research programs in animal science have been established at three locations within the state to study methods for improving the efficiency of livestock production. Dairy cattle research has been conducted for several decades at the Palmer Research Center. Recently, beef-cattle winter-feeding and summer-grazing trials were initiated at our Homer Research Center. A swine research program is located here at Fairbanks where a beef-cattle research herd to study cattle production in interior Alaska is also being developed. Although both the swine and cattle herds at this station are maintained primarily for research, they serve a secondary function by providing livestock for the animal-science courses.



ture. The research is designed to determine if wood-chip piles made during subzero temperatures will remain cool enough inside to permit their being left for at least 2 years. Is is expected that chips in the interior of piles created during warmer temperatures would self ignite within a year. If cold-weather chipping and piling works, an industry using chips either for fuel or fiber could store more than a year's supply at one time.

One mile north of the Fairbanks Research Center's main facility is a demonstration thinning area covering one acre of a 100-year-old stand of white and black spruce. The trees were thinned from 1560 to 260 trees per acre. The principal objective of the research is to determine if the remaining trees will grow more rapidly. Near the thinning site is a planting-trial area started in the early 1960s by research at the U.S. Forest Service Institute of Northern Forestry. The area contains trees not native to Alaska such as Siberian larch, Scots pine, Norway spruce, lodgepole pine, and European birch. Some of these tree species are doing very well and could be used in addition to local species to meet Alaska's future wood needs.



We hope that you have enjoyed your tour of the experiment farm
at the Alaska Agricultural Experiment Station

Agricultural Experiment Station
School of Agriculture and Land Resources Management
University of Alaska-Fairbanks
Fairbanks, Alaska 99701

James V. Drew, Director

Miscellaneous Publication 83-3

PLANT MATERIALS SOURCE LIST

HORTICULTURE

The following list contains sources for seeds and plant materials used in the horticulture demonstration gardens. This list is prepared for your information only and does not imply endorsement of any particular company.

A.R. Zwaan en Zoon B.V., Prinses Mariannelaan 296, P.O. Box 992, 2270 AZ Voorburg, The Netherlands
Abbot and Cobb, Inc., P.O. Box 307, Feasterville, PA 19124
Agway Inc., Seed Division, Box 4933, Syracuse, NY 13221
Alberta Nurseries & Seeds, Ltd., Box 20, Bowden, Alberta T0M 0K0, Canada
All-America Selections, 4546 El Camino Real, Suite A, Los Altos, CA 94022
Asgrow Seed Co., Subsidiary of the Upjohn Co., Kalamazoo, MI 49001
Asmer Seeds Ltd., Asmer House, Ash Street, Leicester, LE50DD England
Bailey Nurseries, Inc., 1325 Bailey Road, St. Paul, MN 55119
Beaverlodge Nursery, Ltd., Box 127, Beaverlodge, Alberta T0H 0C0, Canada
•Bodger Seeds Ltd., Box 5090, El Monte, CA 91734
Charles Klehm & Son Nursery, 2 E. Algonquin Rd., Arlington Hts., IL 60005
•Crookham Co., P.O. Box 520, Caldwell, ID 83605
Dessert Seed Co., P.O. Box 181, El Centro, CA 92243
Environmental Seed Products, Inc., P.O. Box 5904, El Monte, CA 91734
Epicure Seeds, Box 69, Avon, NY 14414
F.W. Schumacher Co., 36 Spring Hill Rd., Sandwich, MA 02563
Farmer Seed & Nursery Co., Faribault, MN 55021
Ferry-Morse Seed Co., P.O. Box 100, Mountain View, CA 94042
•Geo. Ball Pacific, Inc., P.O. Box 9055, Sunnyvale, CA 94088
George W. Park Seed Co., Box 31, Greenwood, SC 29647
Germania Seed Co., 5952 N. Milwaukee Ave., Chicago, IL 60646
•Goldsmith Seeds, Inc., Gilroy, CA 95020
Grace's Gardens, 22 Autumn Lane, Hackettstown, NJ 07840
Gurney's Seed and Nursery Co., Yankton, SD 57079
H.G. German Seeds, Inc., Box N, Smethport, PA 16749
Henry Field Seed & Nursery Co., Shenandoah, IA 51602
Herbst Brothers Seedsmen, Inc., 1000 N Main St., Brewster, NY 10509
Jackson & Perkins Co., Medford, OR 97501
Johnny's Selected Seeds, Albion, ME 04910
Joseph Harris Co., Inc., Moreton Farm, Rochester, NY 14624

K. Van Bourgondien & Sons, Inc., 245 Farmingdale Rd., Babylon, NY 11702
Keystone Seed Co., P.O. Box 1438, Hollister, CA 95023
•Lawyer Nursery, Inc., 950 Highway 200 West, Plains, MT 59859
McFayden Seed Co. Ltd., P.O. Box 1600, Brandon, Manitoba R7A 6A6, Canada
Mellinger's, 2310 W. South Range Rd., Lima, OH 44452
Mountain Seed & Nursery, Box 271 Rt. 1, Moscow, ID 83843
Northrup King & Co., 1500 Jackson St., N.E., Minneapolis, MN 55413
Otis S. Twilley Seed Co., Inc., P.O. Box 65, Trevose, PA 19047
Postbus 40, 2678 ZG DeLier, The Netherlands
Rex Bulb Farms, P.O. Box 774, Port Townsend, WA 98368
Rijk Zwaan Zaadteelt en Zaadhandel B.V. Burgem, Crezeelaan 40 DeLier, The Netherlands
Seedway, Inc., Hall, NY 14463
Siegers Seed Co., 7245 Imlay City Rd., Imlay City, MI 48444
Sluis & Groot of America, 124A Griffin St., Salinas, CA 93907
Stokes Seeds, Inc., 5008 Stokes Bldg., Buffalo, NY 14240
Sun Seeds, 9531 W. 78th St., Suite 229, Eden Prairie, MN 55344
Sutton's Seeds Ltd., Hele Road, Torquay, TQ2 7QJ, Devon, England
T & T Seeds Ltd., Box 1710, Winnipeg, Manitoba R3C 3P6, Canada
Thompson & Morgan, Inc., Box 100 Farmingdale, NJ 07727
Vermont Bean Seed Co., Garden Lane, Bomoseen VT 05732
Vesey's Seeds, Ltd., York, Prince Edward Is., C0A 1P0, Canada
W. Atlee Burpee Co., 6350 Rutland Ave., Box 748, Riverside, CA 92502
W.J. Unwin, Ltd., P.O. Box 9, Farmingdale, NJ 07727
White Flower Farm, Litchfield, CT 06759-0050
•Wilbur Ellis Co., Seed Division, 12001 Empire Way, Spokane, WA 99206
William Dam Seeds, P.O. West Flamboro, Ontario L0R 2K0, Canada

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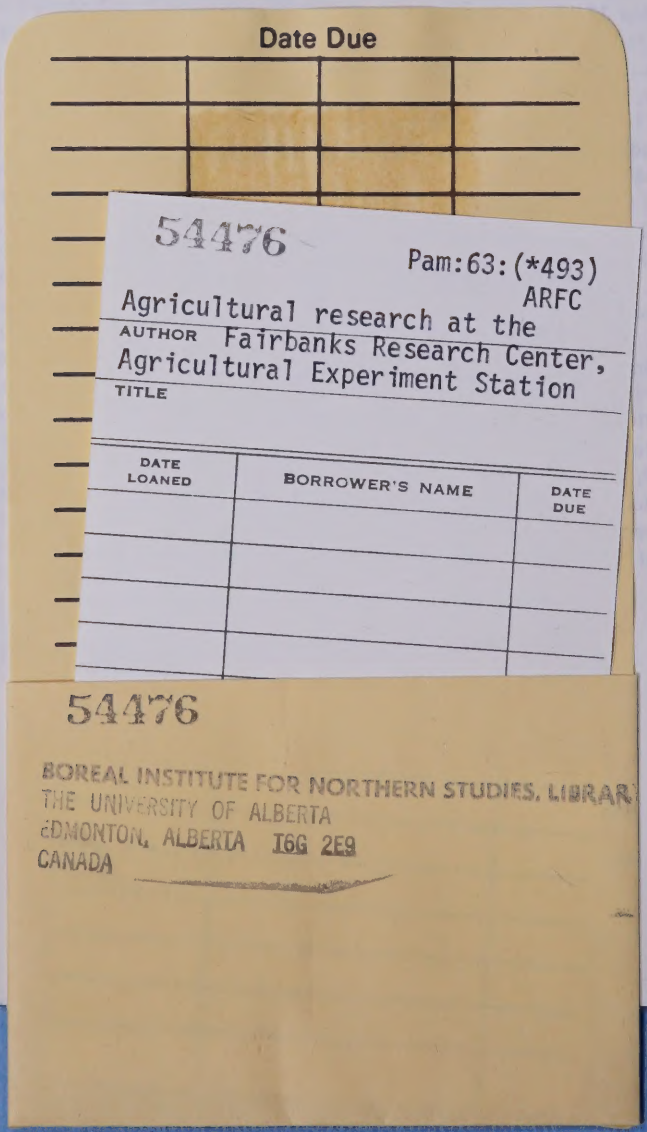
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